Board of Education), and that their students do their teaching practice in the same kind of schools under the same local education authority. These facts would be highly diverting were their consequences not so serious.

This anomalous state of affairs has provoked much criticism in University circles. What complicates matters is the fact that there exists a contributory pension scheme in the Universities—the federated superannuation scheme—which is thought by some to be superior to the Teachers Act in certain respects, such as in cases of death during service and of retirement before the age of sixty, and in the form of benefit on retiral. As against these the Teachers Act is non-contributory, it is retrospective, and its benefits are calculated upon the average salary in the last five years of service. The whole question has been considered by a conference of representatives from the Universities of England and Wales, at which it was unanimously resolved to lay the case before the Chancellor of the Exchequer in terms of the following resolutions:—

"(1) That this Conference is of opinion that the interests of English and Welsh education as a whole demand the institution of a scheme of superannuation for University teachers and administrative officials conferring benefits not inferior to those granted under the School Teachers (Superannuation) Act, 1918, and of a like retrospective character; (2) that such a scheme should make due provision (*a*) for the superannuation of persons who enter the service of a University or University college so late in life as to be unable to acquire the service qualification necessary under the School Teachers Act; (*b*) for meeting the case of persons who retire before the normal age of retirement; and (*c*) for meeting the case of persons who die on service. (3) That any scheme of superannuation for University teachers and administrative officials should be of such a nature as to allow (without loss in respect of superannuation) the transfer of a person employed at a University or University college to another approved educational or scientific institution in Great Britain or *vice versa*."

The term "institution," of course, includes schools. These resolutions have been accepted by the Association of University Teachers. Whatever be the result, it is a great step forward to have secured unanimity on essentials. The resolutions have clearly demonstrated the present absolute inadequacy of the federated superannuation system and the difficulty of patching up its deficiencies as regards retrospective benefits, interchangeability of teachers, and the amount of retiral allowances or annuities.

Aerography.

The Principles of Aërography. By Prof A. McAdie. Pp. xii+318. (London: G. G. Harrap and Co., Ltd., 1917.) Price 21*s*. net.

FROM time to time it has been a subject of remark by the learned that a book on meteorology has to be a collection of essays, because the available material does not lend itself to exposition in a connected treatise. The substitution of the new name aerography for the older meteorology has not changed the leopard's spots. Indeed, Prof. McAdie has made the peculiarities of the subject more remarkable by presenting a work which is partly a collection of meteorological essays, and partly the note-book of a physicist interested in the study of the atmosphere.

Out of eighteen chapters, the first four are a recitation of the physical meteorologist's "credo," which includes absolute units as a theme with variations, preceded by a brief history. There follow nine chapters, which are partly note-book and partly essay; then the essay gradually extends its claim in chapters on atmospheric electricity, precipitation, floods, and notable storms, until it fully asserts itself in a chapter on frosts. Finally, a couple of pages of solar influences lead us to an appendix of conversion-tables and an excellent index.

It is the characteristic of the note-book which will appeal most to the reader. We find a summary of references to the results of modern aerological research which are frequently wanted and not elsewhere at hand. Very useful information about investigations with kites, pilot balloons, and sounding balloons is put in an attractive form. It includes, on p. 19, a table of extreme elevations reached by various means, and much other information of like character. The whole is well illustrated by photographs, maps, and diagrams. It is rather discursive. It begins with the troposphere and stratosphere; winds follow the "major circulation" and the "minor circulation." Ocean currents get a "look in" with the major circulation.

The "credo" is interesting; it shows how careful one has to be in choosing words to express one's meaning. The student has to think when he reads: "The gas constant for the air is not constant. It varies . . . owing to the non-adiabatic character of the atmosphere." "It should be remembered that a gram of ice is by weight a little more than a cubic centimetre, and if pure ice is used only 73 calories are needed" (for liquefaction). Very little unorthodoxy is

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allowed to escape through the meshes of the author's critical net, but he is apparently not concerned with the prevalent yet distracting use of the word "gradient" to mean rate of loss per unit length either in the vertical or horizontal direction when speaking of temperature. In this country we are becoming accustomed to confine the word "gradient" to what is commonly understood when it is used with pressure, and to use "lapse" for vertical changes, which are normally losses, with increasing height.

As readers of NATURE already know, it is part of Prof. McAdie's "credo" that pressure should be expressed in "kilobars," which are now commonly known as "millibars," and that temperature should be expressed in new absolute units of which 1000 go to 273 degrees of the Centigrade scale. In the reviewer's experience of units the whole world is divided into three very unequal parts. By far the largest part is made up of persons who think that absolute units for practical concerns are obviously impossible because the man in the street does not "understand" them at all; the next largest of those who think that absolute units in practice are quite unnecessary because any competent man of science fully understands them and can make the transition whenever he requires them; and the third is a small body of persons who are devoted to their use because the scientific future of meteorology lies that way. To change once more the already changed in order to remove an apparent historical inconsistency conveys no promise of ranging the well-informed minority on the side of progressive action, but would hand us over helpless to the judgment of the great majority who do not "understand," and who are obsessed with the idea that scientific results are naught if they cannot be used without thinking.

Among the excellent illustrations of the book are some photographs of cloud-forms. Its author is very insistent that Luke Howard's classification of cloud-forms on the basis of appearance, as extended by the international conferences, is wrong in principle. He thinks they should be classified according to origin. Unfortunately, the appearance is all that an observer can record, and to ask the ordinary observer to differentiate between similar appearances according to some general instruction as to origin would add materially to the difficulties of the student. What is most wanted is some effective means for the individual observer to ascertain the height of the cloud which he sees. Some simple form of range-finder for clouds suitable for the chief observatories ought not to be beyond the limit of possibility.

The book comes from Blue Hill Observatory, now a part of Harvard University, and contains much incidental information as to the great services which that establishment has rendered to meteorology. Its many friends and admirers in this country will welcome the attempt of its present chief to set out the leading principles of aerography which the observatory has done so much to elucidate.

Paper-making and its Machinery.

Paper-making and its Machinery: Including Chapters on the Tub-sizing of Paper, the Coating and Finishing of Art Paper, and the Coating of Photographic Paper. By T. W. Chalmers. (The *Engineer* Series.) Pp. xi + 178 + vi plates. (London: Constable and Co., Ltd., 1920.) Price 26*s*. net.

THE author in his preface has rightly stated that the chemist interested in paper-making finds ample technical literature at his disposal, whereas the engineer is not provided with any books dealing with the peculiar mechanical problems of his industry. Since the publication of Hofmann's treatise on "The Manufacture of Paper" in 1873 no serious attempt has been made to supply the paper-maker with an intelligent and comprehensive text-book devoted to a study of the economic and efficient control of the machinery peculiar to the manufacture of paper.

Mr. Chalmers's effort in this direction, admirable as it is, regarded in its proper aspect as a pioneer to some such technical treatise, falls far short of our expectations in this direction. It is doubtful whether a really practical and useful text-book on the engineering problems of the paper industry will ever be written. The utility of the book we have in mind will depend on a free and frank *exposé*, by an engineer thoroughly acquainted with the art and practice of paper-making, of conditions, methods, economics, power costs, capacities, output, means for overcoming difficulties, and the hundred "wrinkles" born of long apprenticeship. The description of paper-machines and subsidiary appliances, essential as it certainly is, constitutes only one part, and that the minor part, of an ideal manual.

The causes which have contributed to this lack of information may be traced to the somewhat natural reluctance on the part of a practical engineer to "give away" his knowledge. Every engineer fondly believes he has a monopoly of this kind, and the difficulty of shaking him from such an idea may fully account for the absence of a text-book which would be gladly welcomed by the trade. We may therefore reasonably hope that the present work will inspire some paper-maker to write a supplement.

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